

9:15 a.m.

866-4

**Noninvasive Detection of Severe Stenosis and Total Occlusion in Left Anterior Descending Artery With Transthoracic Doppler Echocardiography in the Emergency Room**

Tomoko Tani, Kazuaki Tanabe, Masatake Sato, Koichi Tamita, Atsushi Yamamuro, Kunihiko Nagai, Kenichi Shiratori, Shigefumi Morioka, Kobe General Hospital, Kobe, Japan

**Background:** Recent advances in transthoracic color Doppler echocardiography provide coronary flow velocity measurement in the left anterior descending coronary artery (LAD). There were few reports that the diastolic to systolic peak velocity ratio (DSVR) measurement by transthoracic color Doppler echocardiography was a simple and noninvasive method for detection of severe stenosis at rest. The purpose of this study is to evaluate the value of DSVR for the noninvasive detection of severe stenosis and total occlusion of LAD in the patients with acute coronary syndrome in emergency room. **Methods:** Using transthoracic pulsed color Doppler echocardiography, we recorded coronary flow velocity of LAD in 23 consecutive patients (pts) with acute coronary syndrome in emergency room. We measured diastolic peak velocity (Dvp) and systolic peak velocity (SVp) and calculated DSVR (=Dvp/SVp). To confirm LAD flow, emergent coronary angiography was performed immediately. **Results:** We detected LAD in 20 out of 23 pts. 2 of 3 pts who had not been detected of LAD revealed total occlusions by coronary angiography. 12 pts had severe stenosis (>90%) of LAD. DSVR of LAD is significantly lower in pts of group with severe stenosis than pts of group without severe stenosis (1.34±0.31 vs. 2.11±0.31, p<0.0001). **Conclusions:** Noninvasive detection of LAD flow and DSVR can accurately diagnose severe stenosis and total occlusion of LAD in emergency room.

9:30 a.m.

866-5

**Coronary Flow Velocity Reserve <2.0 by Transthoracic Doppler Echocardiography Can Detect Myocardial Ischemia Assessed by 201-Thallium Schintigraphy in a Large Population With Coronary Risk Factors**

Yoshiki Matsumura, Takeshi Hozumi, Hiroyuki Watanabe, Kohei Fujimoto, Kenichi Sugioka, Yasuhiko Takemoto, Hiroyuki Yamagishi, Minoru Yoshiyama, Kazuhide Takeuchi, Junichi Yoshikawa, Osaka City University Medical School, Osaka, Japan

**Background:** Transthoracic Doppler echocardiography (TTDE) enabled us to assess significant coronary artery stenosis by noninvasive estimation of coronary flow velocity reserve (CFVR). However, coronary flow reserve can be reduced despite angiographically normal coronary arteries in patients with various coronary risk factors. The purpose of this study was to evaluate the value of CFVR with TTDE for detection of myocardial ischemia in large study population with various coronary risk factors. **Methods:** We examined 108 consecutive patients who underwent exercise thallium-201 single-photon emission computed tomography (TI-201-SPECT) because of suspected angina pectoris. CFVR assessment in the left anterior descending artery (LAD) by TTDE was performed and compared with the results of TI-201-SPECT in all the study patients. Multivariable logistic regression analysis was performed to assess relationships between CFVR <2.0 and age, gender, coronary risk factors and myocardial ischemia in the LAD territories on TI-201-SPECT. **Results:** Of the 108 patients, 17 had myocardial ischemia in the LAD territories, and the remainder (n = 91) had normal perfusion (n = 57) or myocardial ischemia in other territories (n = 34). A cut-off value <2.0 of CFVR had a sensitivity of 88%, a specificity of 86%, a positive predictive value of 54%, and a negative predictive value of 98% for the presence of a reversible perfusion defect in the LAD territory. Multivariable logistic regression analysis showed CFVR <2.0 had the strongest relationship with the myocardial ischemia in the LAD territory after adjustment for the other variables. **Conclusion:** CFVR <2.0 measured by TTDE can be useful index for detection of myocardial ischemia assessed by TI-201-SPECT in large population with coronary risk factors. CFVR measurement by TTDE may be used for alternative to TI-201-SPECT for the assessment of myocardial ischemia.

9:45 a.m.

866-6

**Age-Related Left Ventricular Function Alterations in Mice: A Tissue Doppler Imaging Study**

John G. Morgan, Genevieve Derumeaux, Fumito Ichinose, Candace Lee, Rijuyi Hataishi, Kenneth D. Bloch, Michael H. Picard, Marielle Scherrer-Crosbie, Massachusetts General Hospital, Boston, MA, Rouen University, Rouen, France

**Background:** Cardiac senescence is characterized by a decline in myocardial contractility shown *in vitro* and by pressure-volume relationships. It has not been quantified noninvasively. The 24 month mouse lifespan offers a model to study aging and the heart. We sought to compare left ventricular (LV) size and function in young, adult and senescent mice by conventional echo parameters and tissue Doppler imaging (TDI) and to determine if TDI is more sensitive for detecting a decline in systolic function with age.

**Methods:** Young (3 weeks old, n=9), adult (2 months old, n=15), and old (6-18 months old, n=23) mice underwent M-mode, 2D and TDI echocardiography. LV fractional shortening (FS), LV dimensions and wall thickness were obtained from M-mode (papillary muscle level). Systolic myocardial velocities and posterior wall radial systolic strain rate (SSR) were obtained at frame rates over 300/sec.

**Results:** Aging was associated with an increase in LV mass (see Table). Relative wall thickness (posterior wall thickness x 2/LV diastolic dimension) was less in young than in

adult and old groups. FS was higher in young than in adult and old mice, but failed to identify impairment of systolic function in the old mice. SRR, however, was less in old than in young and adult mice, identifying a decline in systolic function.

	Young	Adult	p (adult vs young)	Old	p (old vs young)	p (old vs adult)
Weight (g)	12.6±1.7	28.7±1.6	<0.001	40.2±8.7	<0.001	<0.001
LV mass(mg)	0.5±0.1	0.9±0.1	<0.001	1.1±0.3	<0.001	<0.05
LV mass/weight	4.1±1	3.0±1	<0.05	2.7±1	<0.001	ns
Relative wall thickness%	44±7	63±9	<0.05	66±17	<0.05	ns
FS%	59±6	54±6	ns	52±5	<0.05	ns
Endocardial velocity(cm/s)	1.8±0.3	1.9±0.4	ns	1.5±0.3	<0.001	<0.05
Epicardial velocity(cm/s)	1.2±0.4	1.3±0.4	ns	0.9±0.3	<0.001	<0.05
SSR	2.0±0.3	1.8±0.4	ns	1.4±0.2	<0.001	<0.001

**Conclusions:** In mice, echocardiography demonstrated a change in cardiac morphology with age. While conventional echo parameters lacked sensitivity, TDI demonstrated a decline in LV systolic function with age.

## ORAL CONTRIBUTIONS

**881 Contrast Echocardiography: Here at Last**

Wednesday, March 10, 2004, 10:30 a.m.-Noon  
Morial Convention Center, Room 343

10:30 a.m.

881-1

**Triggered Replenishment Imaging Improves Reproducibility of Myocardial Contrast Echocardiography**

Klaus Tiemann, Alex Ghanem, Stefanie Kuntz-Hehner, Antony N. DeMaria, Monet Strachan, Berndt Lüderitz, University of Bonn, Bonn, Germany, University of California at San Diego, San Diego, CA

**Objectives -** We studied variability (CV), reproducibility and validity of quantitative myocardial contrast echocardiography (MCE) in a rest - vasodilator protocol (adenosine) at two experienced centers using real-time perfusion imaging (RTPI) and triggered replenishment imaging (TRI) at low emission power.

**Background -** The assessment of replenishment kinetics (RK) following ultrasound induced destruction of contrast microbubbles allows quantification of tissue perfusion applying the model  $f(t) = A \cdot (1 - e^{-\beta t})$ , with parameter  $\beta$ ; describing mean flow velocity and parameter A representing blood volume. However, only little data on the reproducibility of RK in a clinical scenario is available.

**Methods -** Repeated MCE at rest and during stress was performed in 36 patients. To assess validity of MCE to detect coronary artery disease (CAD), myocardial perfusion reserve (MPR) was calculated in both centers and compared with quantitative coronary angiography and Doppler derived flow reserve measurements (CFR).

**Results -** Parameter A was found to be robust (CV < 7.2% ± 5.1). For  $\beta$  highest CV was found for RTPI if only one frame per heart-cycle was considered (32.2% ± 18.9). New averaging algorithms improved CV to 14.6% ± 12.6. Variability was lowest for TRI in apical segments (CV: 6.5% ± 5.2, p<0.01). MPR in flow-limiting CAD was significantly smaller as compared to normal subjects (p< 0.01) and no significant differences were found between both centers (regression MPR/CFR: Bonn: 1.31x+0.29, r=0.62, p< 0.0001; San Diego: 1.27x + 0.33, p=0.006).

**Conclusions -** TRI improves reproducibility of MCE studies. Quantitative MCE and calculation of MPR allow investigator independent assessment of severity of CAD.

10:45 a.m.

881-2

**The Ability of a Dobutamine Stress Contrast Enhanced Echocardiogram to Improve the Detection of Coronary Artery Disease: Results From the CADET Pilot Study**

Thomas R. Porter, Arthur J. Labovitz, Michael H. Picard, Bruno Cotter, Edward L. O'Leary, Harald Becher, Anna C. McGrain, Anthony N. DeMaria, Feng Xie, University of Nebraska Medical Center, Omaha, NE

**Background.** The Contrast Enhanced Dobutamine Echo Trial (CADET) is a prospective multi-center study designed to test the hypothesis that myocardial perfusion (MP) obtained with intravenous (IV) contrast and real time low mechanical index imaging (RTLMII) will improve test sensitivity when compared to wall motion (WM) analysis with or without contrast-enhanced border detection (CEBD). **Methods.** This hypothesis was tested in 29 pilot patients presenting with chest pain and intermediate to high pre-test probability (mean age 57±11 years, 11 female). Patients with a previous myocardial infarction were excluded. Each patient underwent two dobutamine stress echo (DSE) studies: One with high mechanical index harmonic imaging to analyze WM without contrast, and one with RTLMII at frame rates >25 hertz and IV Option to assess MP, and WM with CEBD. All patients underwent quantitative coronary angiography (QCA) within 96 hours of presentation. MP abnormalities were defined as a regional lack of myocardial opacification and assessed according to coronary artery territories (CAT). MP and WM during the DSE with contrast were examined at an intermediate stage (65-75% predicted heart rate), and again at peak stress (>85% predicted heart rate). All studies (with and without contrast) were read by two outside reviewers (R1 and R2) who were blinded to the results